Project Finance Structuring and Risk Analysis
Course Outline

Overview

The course is designed to investigate how various project finance techniques can be used to achieve a competitive bid prices while maintaining a satisfactory equity return. The course will begin by discussing project finance risk allocation, structuring, ring fencing and contract design with a very quick review of famous project finance cases. The first sessions will address the theory underlying liquidated damages for delay, and performance as well as design of other incentives that is inherent in different contract structures. A term sheet for solar case will then be used to discuss nuanced project finance issues associated with structuring debt including under what conditions the DSCR drives debt capacity and when the debt to capital ratio is instrumental. The term sheet analysis will assure that participants understand motivations of banks and other financial institutions in funding projects. Using this solar case, elements including (1) bullet payments and mini-perms; (2) partial exposure to floating rates, (3) use of local bank debt, (4) terminal value assumptions; (5) aggressive development fees and development costs; (6) partial sale of equity investment to other investors, (7) debt sculpting on assumed inflation; (8) letter of credit in lieu of DSRA; (9) assumed re-financing to avoid step-up margins; (10) use of staged investments to partially finance equity investment; (10) earning profit on maintenance contracts; (11) equity bridge loans at variable interest rates are compared to pro-rate financing. The effects of these various items is accumulated and evaluated in terms of LCOE using real and nominal measurements.

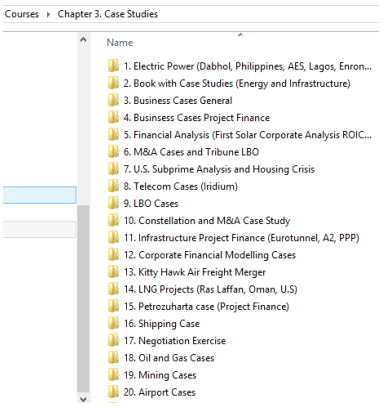
The course will be taught using case studies, contract term sheets (including loan agreements), industry reports and some use of focused financial model examples. There will be no construction of financial models or entering of equations in an excel spreadsheet.

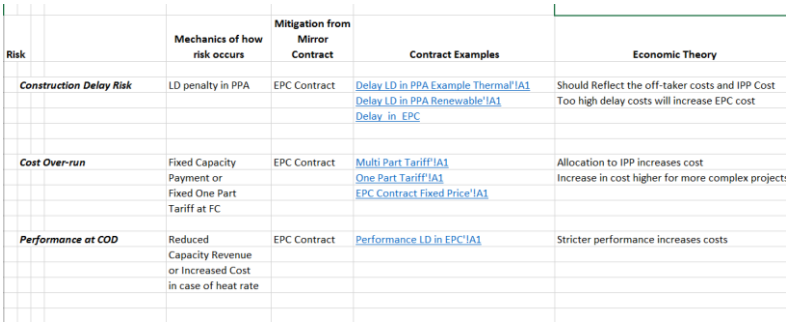
Outline

This outline describes proposed subjects for the course including details and key themes of the discussion. Excerpts of files -- term sheets, contracts, case studies, theory articles and project finance analysis -- used to address the subject are included in the outline. These excerpts are shown so that when participants attend the course, they can use the outline to later recall where to find information and study the subjects in more detail.

Day 1: 9:00 – 10:00: The Essence of Project Finance, Risk Analysis and Contract Structuring

The first session addresses what is project finance and why it is applied. The idea is to take a step backwards and consider what project finance is and how it is designed so that participants understand how cash flow analysis and ring fencing can allow risk to be isolated and defined and projects to be constructed. A few case studies of famous project finance successes and failures will be used to demonstrate fundamental concepts of a risk matrix, general risk allocation, proven technology, strong sponsorship, back-to-back contract design and the importance of economic viability of projects. Examples of risk allocation matrices will be used to demonstrate how the DSCR and LLCR can be used to determine acceptable unmitigated risks (using the formula: break-even cash flow reduction = (DSCR-1)/DSCR. Different project finance structures that involve availability payments versus output-based revenues; commodity price (merchant) risk; traffic or volume risk (pipelines) and resource risk (wind, solar and run of river hydro) will be derived. For each of the project finance types, an illustrative risk allocation matrix and project diagram will be developed. The general idea the project finance debt falls somewhere around BBB- and how credit spreads are driven by the probability that the DSCR will fall below 1.0 will also be addressed.

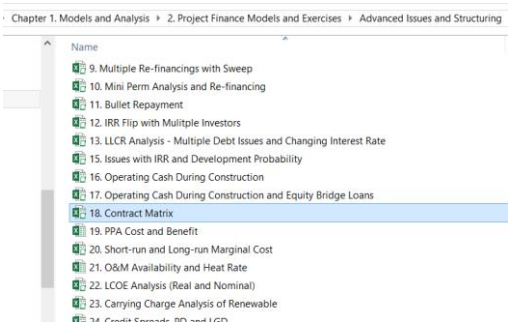


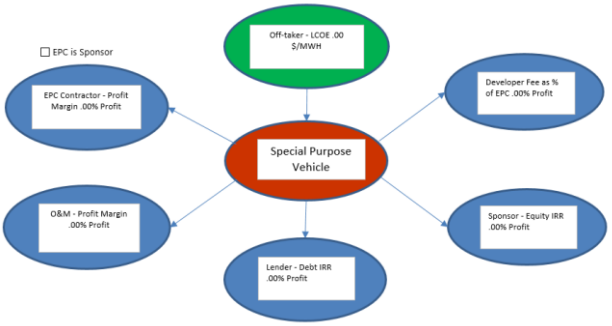


Risk	Mechanics of how risk occurs	Mitigation from Mirror Contract	Contract Examples	Economic Theory
Construction Delay Risk	LD penalty in PPA	EPC Contract	Delay LD in PPA Example Thermal'!A1	Should Reflect the off-taker costs and IPP Cost
			Delay LD in PPA Renewable'!A1	Too high delay costs will increase EPC cost
			Delay_in_EPC	
Cost Over-run	Fixed Capacity Payment or Fixed One Part Tariff at FC	EPC Contract	Multi Part Tariff'!A1	Allocation to IPP increases cost
			One Part Tariff'!A1	Increase in cost higher for more complex projects
			EPC Contract Fixed Price'!A1	
Performance at COD	Reduced Capacity Revenue or Increased Cost in case of heat rate	EPC Contract	Performance LD in EPC'!A1	Stricter performance increases costs

Day 1: 10:00 – 10:45: Creating or Destroying Value through Contract Provisions Including Liquidated Damages, Penalty Provisions and Efficiency Incentives

This section considers how different parties in project finance including EPC contractors, O&M contractors, insurance companies, financial institutions and sponsors are paid for taking risk. The general idea that if parties are paid too much or too little for accepting risk, the off-taker will pay too much for the service and/or sponsors will not receive an adequate return will be demonstrated. Details of transferring risk through performance or delay liquidated damages and other detailed aspects of contracts will be addressed. Examples of excessive EPC profits or paying too much for heat rate guarantees will be discussed in the context of the long-run and short-run marginal cost of electricity. A key theme of the session will be that off-taker economics as well as the technical aspects of the facility must be fully understood to effectively negotiate project finance terms. PPA contracts and EPC contracts will be used to demonstrate the theory and practice of computing delay liquidated damages, availability penalties, target heat rates and other items through the central idea of minimizing the sum of off-taker costs and IPP costs.

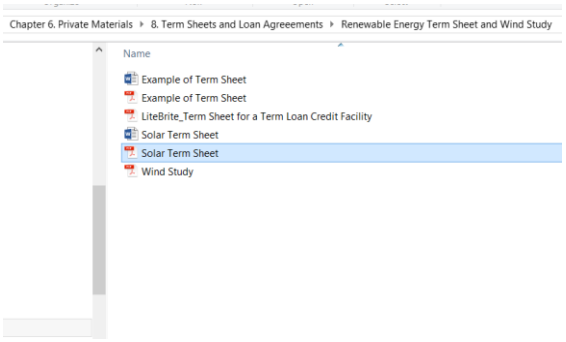


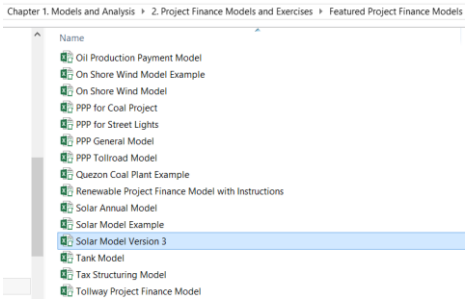


Day 1: 11:00 – 11:30 – Bank Perspective in Project Finance: Risk Analysis and Structuring

This session is designed so that participants can understand a bank perspective in project finance. The difference between risk analysis (portfolio management) and risk structuring will be discussed from the perspective of a bank. The theory and practice of credit spreads and the manner in which banks measure returns (RAROC) will be introduced. Downside scenarios for risk analysis and credit reports will be introduced along with covenants, cash flow sweeps and reserve accounts. The structuring of project finance debt will be introduced through taking a step back with respect to loans and understanding that issues associated with project finance debt can be broken down into five components: (1) debt sizing; (2) debt funding (pro-rata, equity

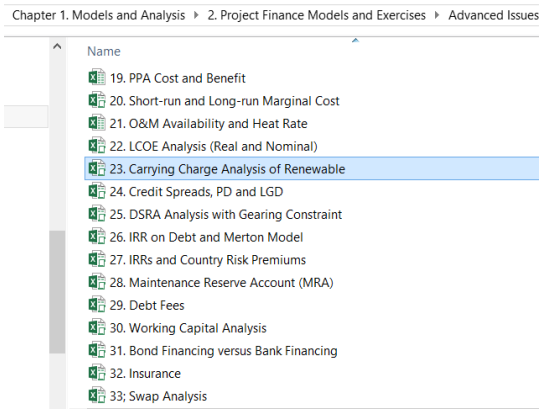
first, equity bridge loan); (3) repayment tenor and repayment type; (4) interest and fees; and, (5) credit enhancements such as covenants and reserve accounts.

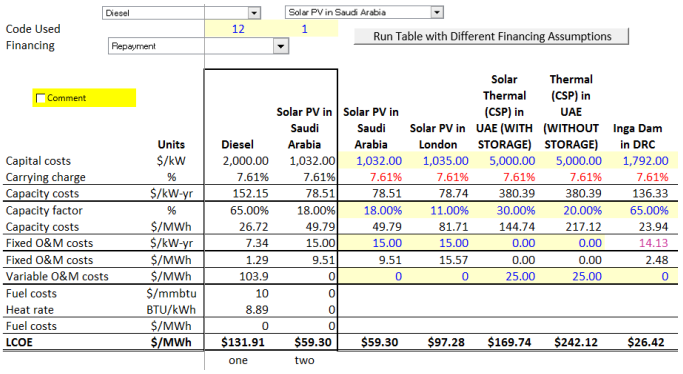




Day 1: 11:30 – 13:00: Effect of Loan Structuring Provisions on Bidding for Projects

This session will address the importance of project finance loan elements for different electricity technologies in different regions of the world. Elements of a term sheet are briefly introduced and evaluated in the context of both the equity IRR and the bid price. The theory of using real and nominal LCOE to evaluate the economics of a project are described and an example of the LCOE formula --NPV(revenues)/NPV(generation) from an RFP will be presented. The theory of why LCOE applies NPV(generation) will be summarized. Next, the effects of debt sizing, debt tenor, debt repayment type and debt pricing on LCOE will be demonstrated in the context of alternative technologies. After the general cost of capital discussion, items of a term sheet such as the minimum DSCR, maximum debt to capital, step-up credit spreads, debt sculpting, debt funding, DSRA's, MRA's and cash sweeps will be used to evaluate financial impacts of various financing and timing issues on the required bid price for a renewable project.

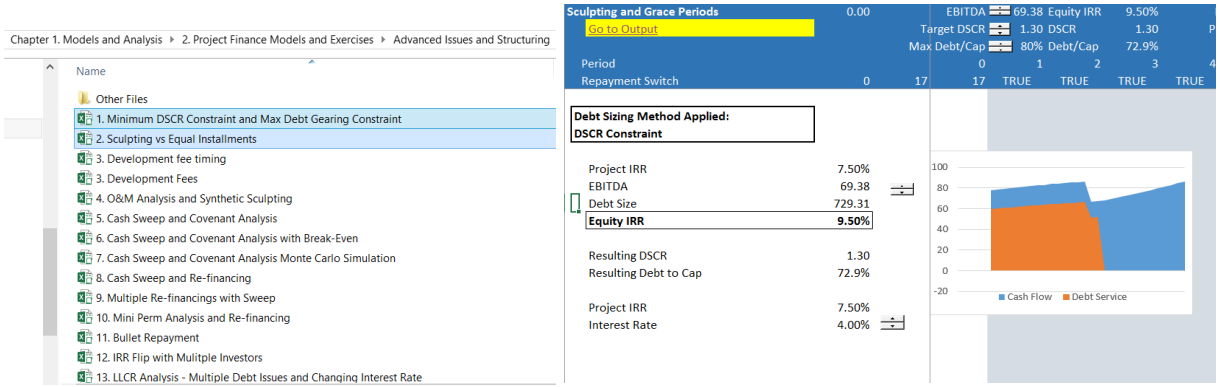




Day 1: 14:00 – 15:00: Debt Sizing: Nuances of Debt to Capital Constraint and DSCR Constraint in Different Circumstances

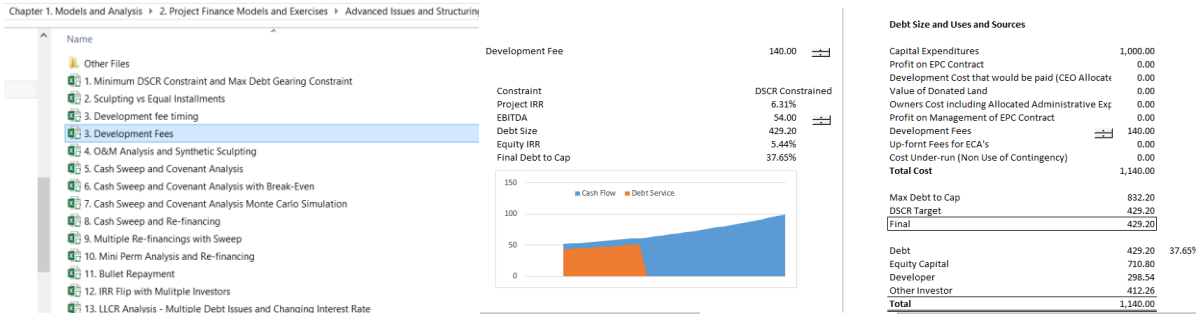
Detailed analysis of the term sheet and loan agreements begins with debt sizing. The difference in sizing debt on the basis of the debt-to-capital ratio relative to the DSCR involves the notion of whether forward looking cash flow can be relied upon or alternatively whether the amount of "skin in the game" measured by accounting costs is more reliable. This session demonstrates how development fees, owner costs, development costs, contingencies and other items that can increase the cost of a project affect returns primarily when the debt to capital constraint applies and have less or no importance when the DSCR drives debt capacity. Other items have an effect on whether the debt to capital constraint or the debt to capital constraint applies: (High Project IRR → Debt to constraint; Long Tenor → Debt to Capital Constraint; Sculpting → Debt to Capital Constraint; Low Interest Rate → Debt to Capital Constraint). (Low Project IRR → DSCR

Constraint; Short Tenor → DSCR Constraint; Level Payment → DSCR Constraint; High Interest Rate → DSCR Constraint)



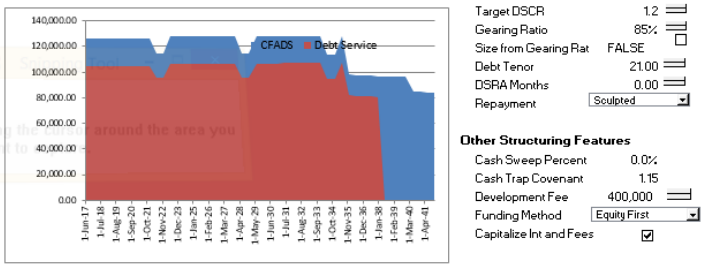
Day 1: 15:00 – 15:30: Debt Sizing: Including Items in Project Cost that do not Involve Cash Outflow to Increase Returns (Contributed Assets, Allocated Overhead Costs, Owners Costs, Development Fees etc.)

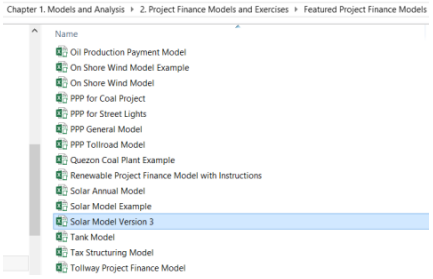
Demonstrate that accounting allocations to the project can have large effects on the equity IRR through debt sizing derived from the debt to capital ratio. If the DSCR drives debt sizing, the accounting allocations, fee allocations and other adjustments have no effect on the equity IRR. Discuss further that the account allocations and non-cash contributions can change the structure of returns when multiple investors are involved in the project. Depending on the manner in which project costs are accounted for, multiple investors pay debt service and receive dividends, but the investor who did not invest as much cash effectively borrows less.



Day 1: 15:45 – 17:00: Debt Sizing: Profits from EPC Contractors or O&M Contractor when Investor is also Contractor

The final debt sizing issue involves how the contract structure can affect the size of debt. If the EPC profits do not affect the debt size and there is only one investor, placing profits at the EPC contractor level or the investor level does not influence overall returns. However, depending on whether the debt to capital constraint applies or there are multiple investors, EPC profits can increase debt size. Cash Flow Waterfall and issues associated with including profits in O&M contract rather than in SPV cash flow. Profits on the O&M contract versus including O&M costs at the SPV level can affect the distribution of dividends as the O&M fee is paid before debt service.

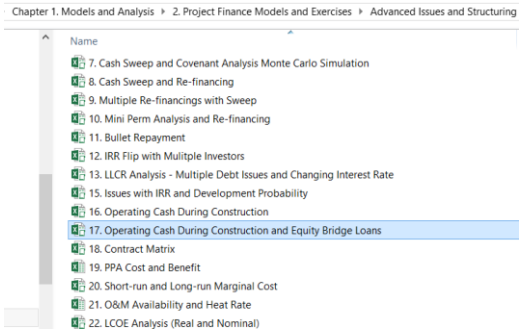


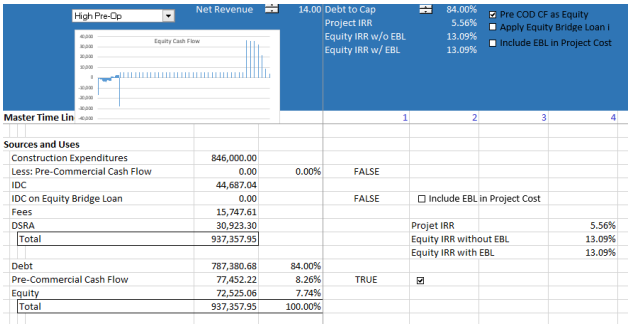


Day 2: 9:00 – 10:00: Debt Funding: Nuanced Issues with Pre-Commercial Cash Flow and Equity Bridge Loans

The first part of the second day moves to debt draws which is guided by reading a term sheet. In pure project finance, equity should be contributed before debt during the construction period to assure that equity does not walk away from the project during construction. Pro-rata debt and equity contributions or equity bridge loans require some kind of sponsor support and can in theory distort the equity cash flow. An equity bridge loan requires parent support, the cost of which is not included in the equity IRR. The effects of IDC on equity bridge loan on project taxes and the effects of equity bridge loans in different interest rate environments and on different types of projects will be discussed.

In addition to EBL and pro-rata funding, the effects of accounting for pre-commercial cash flows as either equity or reduction in project cost will be addressed. Related issues include the issue of government grants and early production. Demonstrate with extreme case the labelling the pre-commercial cash flow as equity results in improved returns but from banker's perspective is not "skin in the game."



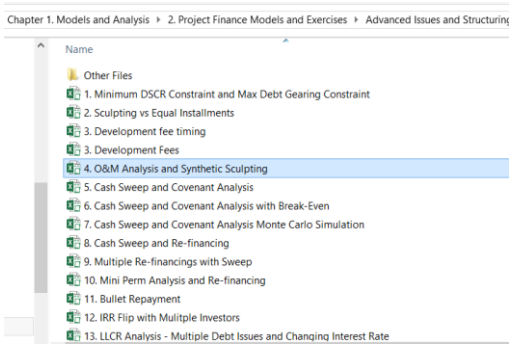


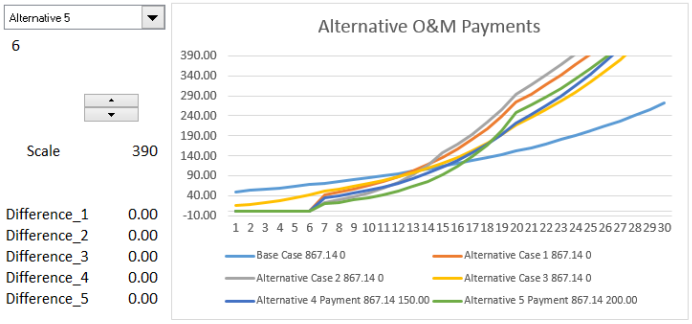
Day 2: 10:00 – 10:45: Debt Repayment Structure: Sculpted Repayment and Nuanced Issues associated with Debt to Capital or DSCR Constraints Combined with Repayment Patterns

In discussing the repayment structure of project finance loans, different term sheets are used to discuss alternative repayment patterns. Given a DSCR constraint and the formula that the present value of debt service equals the amount of debt at COD, the use of geometry to maximize debt is explained. The general idea of maintain a constant DSCR over the life of a project is addressed when the risks can increase over time. This is contrasted to the requirement that banks much increase capital with longer terms and that an implicit assumption of constant credit spreads is increasing risk over time. Sculpting versus alternative methods will be discussed in the context of different revenue patterns (indexation, flat fee-in tariffs, tax depreciation, etc.)

For some countries and financial institutions, DSCR constraints and debt repayment patterns are given. In these cases, synthetic sculpting can be developed with alternative tariff structures that have a step down element (Malaysia, Pakistan) and in other cases a flexible maintenance

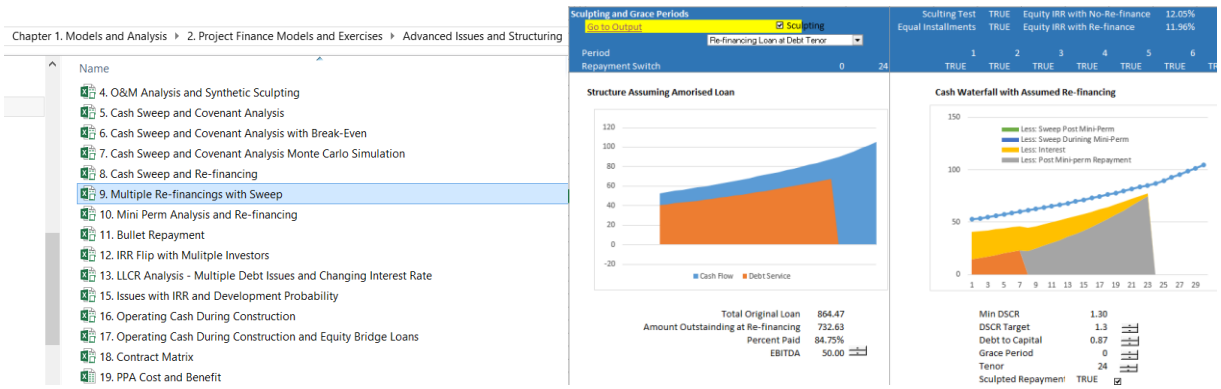
contract can be used to create synthetic sculpting (Brazil). Incentive issues associated with step-down tariffs where sponsors can have an incentive to walk away from the project and techniques to measure the cost and benefits of alternative maintenance structures will be addressed as part of the session.





Day 2: 11:00 – 12:00: Repayment Tenure: Length of Debt Repayment, Mini-perms, Bullet Repayments and Re-financing

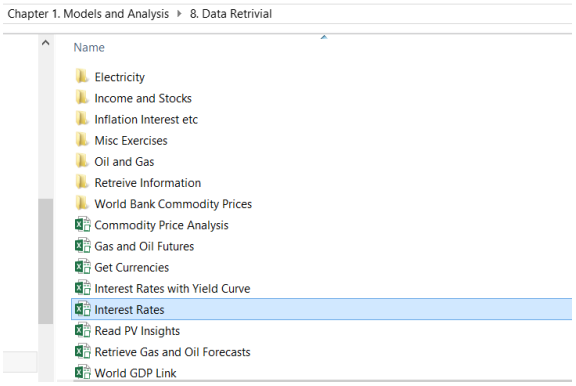
The course will move from the repayment structure to the repayment tenure. Matching the tenor of repayment to the life of the project and even considering terminal value in the repayment will be discussed in the context of both achieving a higher DSCR and an improved equity IRR. Problems with multi-lateral agencies that allow long-term maturity will be contrasted with commercial banks and bond financing that may be more flexible and sometimes could have lower costs. Specifically, the effects of hard and soft mini-perms on the profitability of a project will be discussed along with the difficult problem of required re-financing assumptions. In addition, the session will cover issues of how the DSRA could be used to re-finance debt at end of loan life and how potential terminal value can be used to justify partial bullet repayment at end of loan.

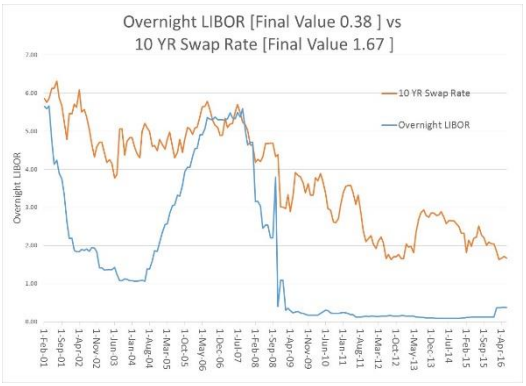


Day 2: 12:00 – 12:30: Interest and Fees: Step-up Credit Spreads, Swap Rates and Hedging

Consistent with the discussion of debt as having five components, interest and fees between the time debt draws occur and debt is fully repaid is the next topic. As with the other project finance loan subjects, it is described by fully understanding term sheets for loan agreements. The first issue discussed is the question of credit step-up credit spreads – why they are present in many transactions and what they mean in terms of re-financing. The issue of whether step-up credit spreads should be included in base case analyses and how risks of changed circumstances after re-financing is considered. A second topic discussed in the context of interest rates is the subject of hedging and interest rate swaps with use of the ISDA master

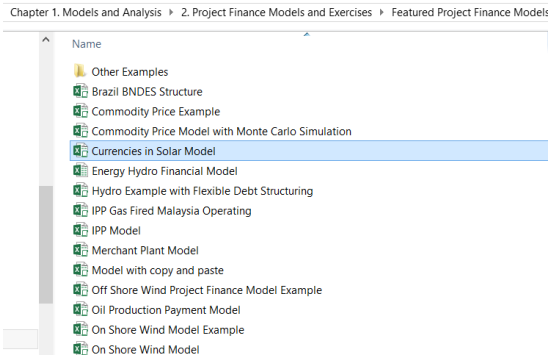
agreement. Alternative structures that incorporate some interest rate risk with caps and floors and the types of transactions that have some natural hedging against varying interest rates will also be addressed.

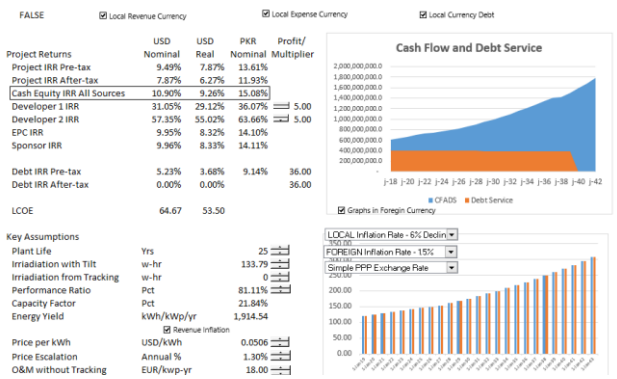




Day 2: 12:30 – 13:00: Interest Rates and Fees: Multiple Currencies and Debt Fees versus Credit Spreads

Continuing discussion of interest rates in project finance addresses the subject of currency risk and cash flows. The general theory of purchasing power parity and the idea that currencies can deviate from inflation parity introduces the issue. In addition, the notion that nominal interest rates with seemingly high credit spreads can be lower in real terms than interest rates from multilateral agencies is demonstrated. In addition the general idea of computing an all-in interest rate that includes up-front and commitment fees is considered. As with other topics, the assessment of fees versus credit spreads will consider re-financing and debt to capital versus the DSCR constraint.



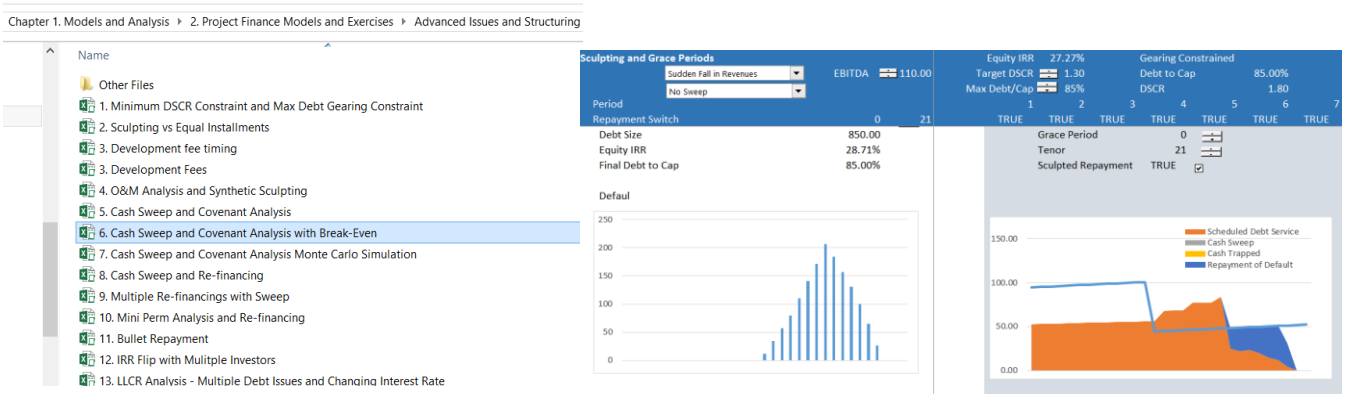


Day 2: 14:00 – 15:30: Credit Enhancements: DSRA, MRA, Cash Flow Sweeps and Covenants

The fifth and final aspect of project finance debt are the various added provisions that are included in loan agreements to provide additional protection to lenders. These provisions that can include DSRA's, MRA's, Cash sweeps and dividend lock-up covenants are addressed after the other project finance terms. It is emphasised that while the credit enhancements can be the subject of intense negotiation, they cannot change a failed project into a good project from a lender perspective. Instead, they can only either limit dividends or reduce the amount of effective net debt associated with a project. Cash sweeps, reserve accounts and covenants can have negative effects on the equity IRR of a project and methods to consider the risk benefits to the bank versus the costs to sponsors are addressed. Mechanics of cash sweep with different

triggers and theory of what kinds of transactions would be relevant for cash sweep (e.g. hydro but not solar because of volatility) are addressed. The theory of what kind of triggers make sense (Debt/EBITDA but not DSCR and operational triggers) will also be discussed as well as the contrast between cash sweeps and cash trap covenants. As with other issues, the effects of cash sweeps on equity returns will be addressed with and without re-financing assumptions.

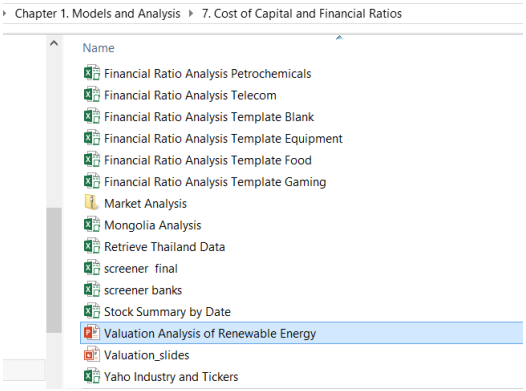
In understanding credit enhancements, the difference between analysis with the DSCR, LLCR and PLCR will be discussed. This will deal with computational problems of LLCR in the context of changing interest rates and multiple debt facilities. The economics of DSRA's and MRA's will be addressed from the theoretical perspective of net debt. Economics of Maintenance Reserve Accounts for inverters and other equipment. Cost of maintaining maintenance reserve account for items such as inverter replacement relative to including costs in maintenance contracts. Effects of major maintenance on tax expense and DSCR.

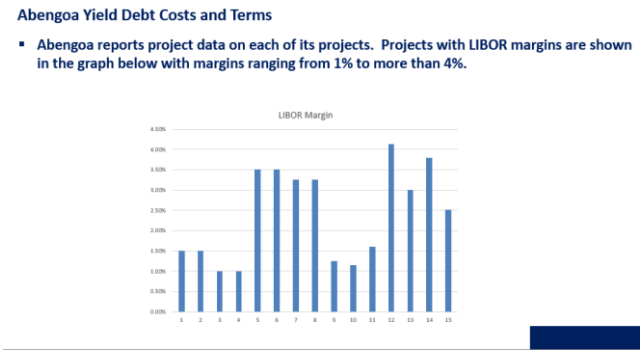


Day 2: Final Session 15:45 – 17:00: Other Project Finance Subjects: IRR problems, Risk and Value Changes over Life of Project, Resource Analysis and Debt Sizing,

The final session is a lecture and discussion about a host of project finance issues related to measuring returns, assessing asset management strategy, understanding differences between different projects and distributing profit between different investors.

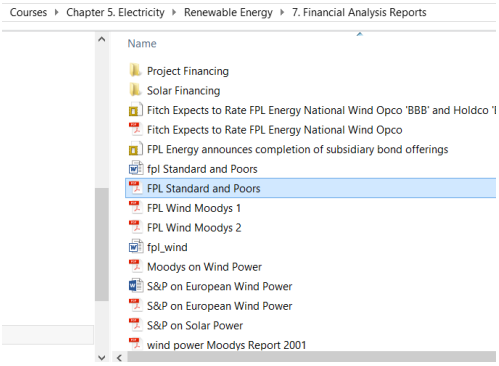
The first part of the session will address methods of accounting for changing risk over different stages of a project. Discussion will include alternative measures of return to account for development success probability, changing risk over life of project, long-term cash flows with high IRR, and most importantly, distortions from applying arbitrary country risk premiums. IRR distortions that come from development risk, changing risk, long-term high returns, country risk premiums and better measures of profitability will be demonstrated. Yieldco cost of capital and strategy will be used to demonstrate the issues as well as the problems with selling assets to attempt to maximize value. In discussing projects have differences in risk reduction over time, the discussion will consider why wind projects probably have more of a risk reduction than other electricity projects. In addition, the discussion will incorporate how optimal holding periods can be computed with different IRR hurdle rate assumptions.





Flip structures that have been applied to use the tax benefits of renewable projects. The discussion will address how flip structures can be used to attract different groups of investors where dividends are distributed in one way before the flip and a different way after the flip. This will show the flip structures can in reality be similar to a cash flow sweep and that rates for investors who have a first call on cash flow should be similar to interest rates on safe debt.

Resource analysis and alternative debt sizing. Briefly discuss one-year versus long-term P90, P99 etc. Use a spreadsheet with differences between P90 and P50 along with alternative debt structures and tariffs to demonstrate how alternative debt sizes can come into play.



production from sites that have a significant operational data.

Summary of project and portfolio energy forecasts.

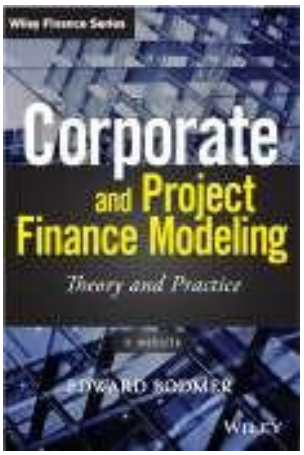
Table 4 presents a summary of Garrad Hassan's forecast energy production for each project and the portfolio. As shown, at a P90 one-year confidence level the portfolio production forecast is 1,816 GWh per year, which is 10% higher than the sum of the individual P50 one-year average forecasts for each project.

Project and Portfolio Energy Production Forecasts									
Site	LB II	CGordo	SW Mesa	Hancock	HWinds	New Mex	Montfort	Total project	Portfolio forecast
Rated power	103.5	41.3	74.9	97.7	145.8	204.0	30.0		697
Net energy (GWh/year)	333.0	104.5	231.8	288.5	476.5	536.6	57.6		2,029
Net capacity factor (%)	36.7	28.9	35.3	33.7	37.3	30.0	21.9		33

1-Year Average

Our Expert Faculty

Edward Bodmer
Consultant



Edward Bodmer provides financial and economic consulting services to a variety of clients, he teaches professional development courses in an assortment of modelling topics (project finance, M&A, and energy). He is passionate about teaching in Africa, South America, Asia and Europe. Many of the unique analytical concepts and modelling techniques he has developed have arisen from discussion with participants in his courses. Professor Bodmer has taught customized courses for MIT's Sloan Business School, Bank Paribas, Shell Oil, Society General, General Electric, HSBC, GDF Suez, Citibank, CIMB, Lind Lakers, HSBC, Saudi Aramco and many other energy and industrial clients. Bodmer's consulting activities include developing complex project finance, corporate and simulation models, providing expert testimony on financial and economic issues before energy regulatory agencies, and advisory services to support merger and acquisition projects.

Mr Bodmer has written a textbook titled ***Corporate and Project Finance Modelling, Theory and Practice*** published by Wiley Finance. The book introduces unique modelling techniques that address many complex issues that are not typically used by even the most experienced financial analysts. For example, it describes how to build user-defined functions to solve circular logic without cumbersome copy and paste macros; how to write function that derives the ratio of EV/EBITDA accounting for asset life, historical growth, taxes, return on investment, and cost of capital; and how to efficiently solve many project finance issues related to debt structuring. Bodmer is in the process of writing a second book that describes a series of valuation and analytical mistakes made in finance. This book uses many case studies from Harvard Business School that were thought to represent effective business strategies and later turned into valuation nightmares.

Over the course of his career Professor Bodmer has been involved in formulating significant government policy related to electricity deregulation; he has prepared models and analyses for many clients around the world; he has evaluated energy purchasing decisions for many corporations; and, he has provided advice on corporate strategy. Mr Bodmer's projects include development of a biomass plant, analysis and advisory work for purchase of electricity generation, distribution and transmission assets by the City of Chicago, formulation of rate policy for major metro systems and street lighting networks, advocacy testimony on behalf of low income consumers, risk analysis for toll roads, and evaluation of solar and wind projects. He has constructed many advisory analyses for project finance and merger and acquisition transactions.

Professor Bodmer was formerly Vice President at the First National Bank of Chicago where he directed analysis of energy loans and also created financial modelling techniques used in advisory projects. He received an MBA specializing in econometrics (with honours) from the University of Chicago and a BSc in Finance from the University of Illinois (with highest university honours). Mr Bodmer was born in Manchester, England, he lived in Switzerland as a child, and currently resides in Chicago. You can find more information on his website www.edbodmer.com.